

# Acute Kidney Injury

## Definitions Evolution

**Hussein Sheashaa, MD**

Professor of Nephrology, Urology and Nephrology Center and Director of Medical E-Learning Unit, Mansoura University and Executive Director of ESNT- Virtual Academy:

<http://lms.mans.edu.eg/esnt/>



# Electronic Nephrology Education: ESNT Virtual Academy

Turn editing on

The Annual Nephrology Unit, IMD, Mansoura Universi...

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## The Annual Nephrology Unit, IMD, Mansoura University Feb 3-10.2015

**First Day: Tuesday 3.2.2015**

First Day: Tuesday 3.2.2015



News forum



Nutrition in Acute Kidney Injury. Dr Olfat Abdelhalim



Nutrition Assessment in Renal Disorders. Dr Olfat Abdelhalim



NAVIGATION



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First Day: Tuesday  
3.2.2015

Second day: Wednesday  
4.2.2015

Third Day: Thursday  
5.2.2015



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UPCOMING EVENTS



There are no upcoming events

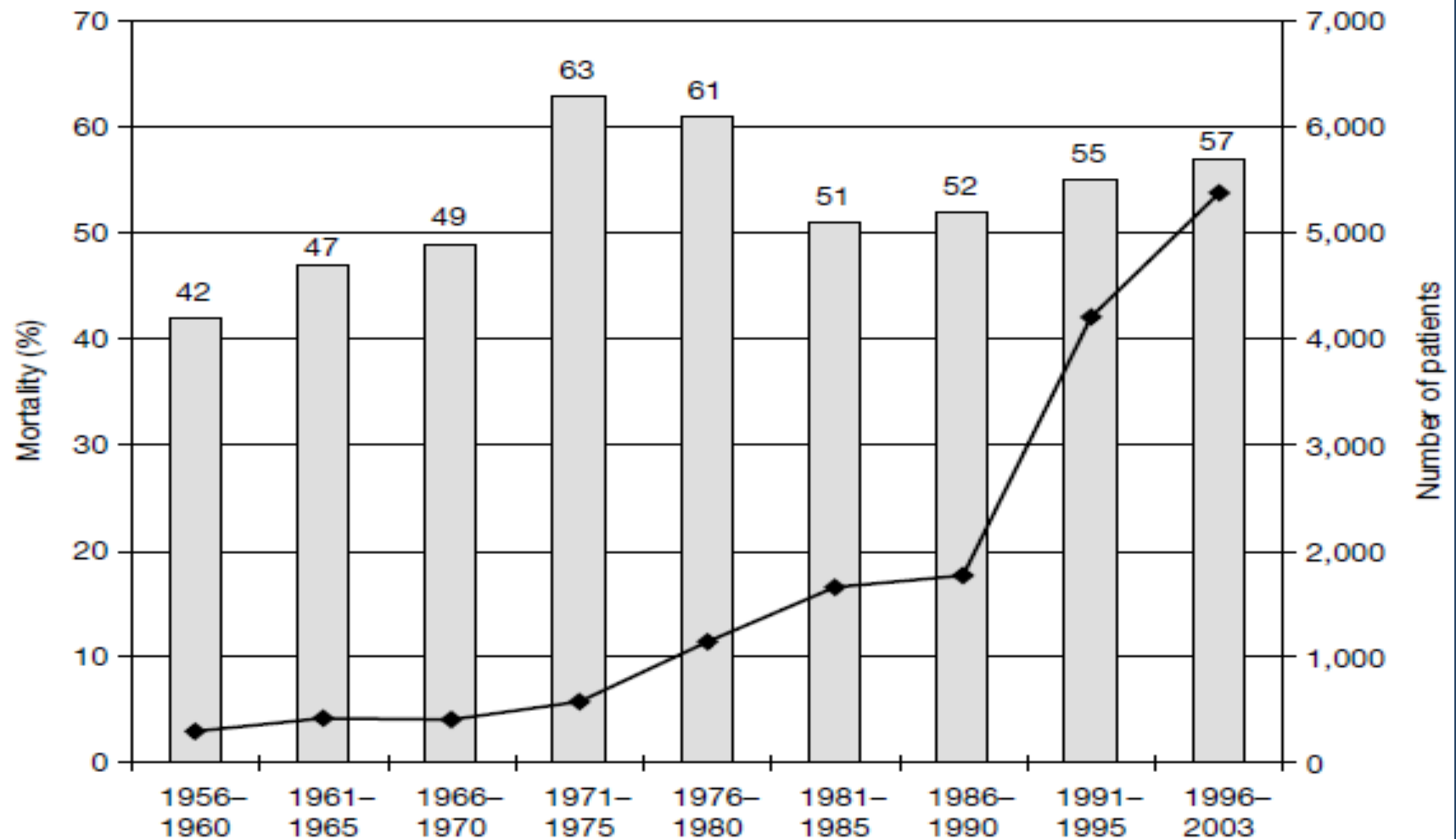
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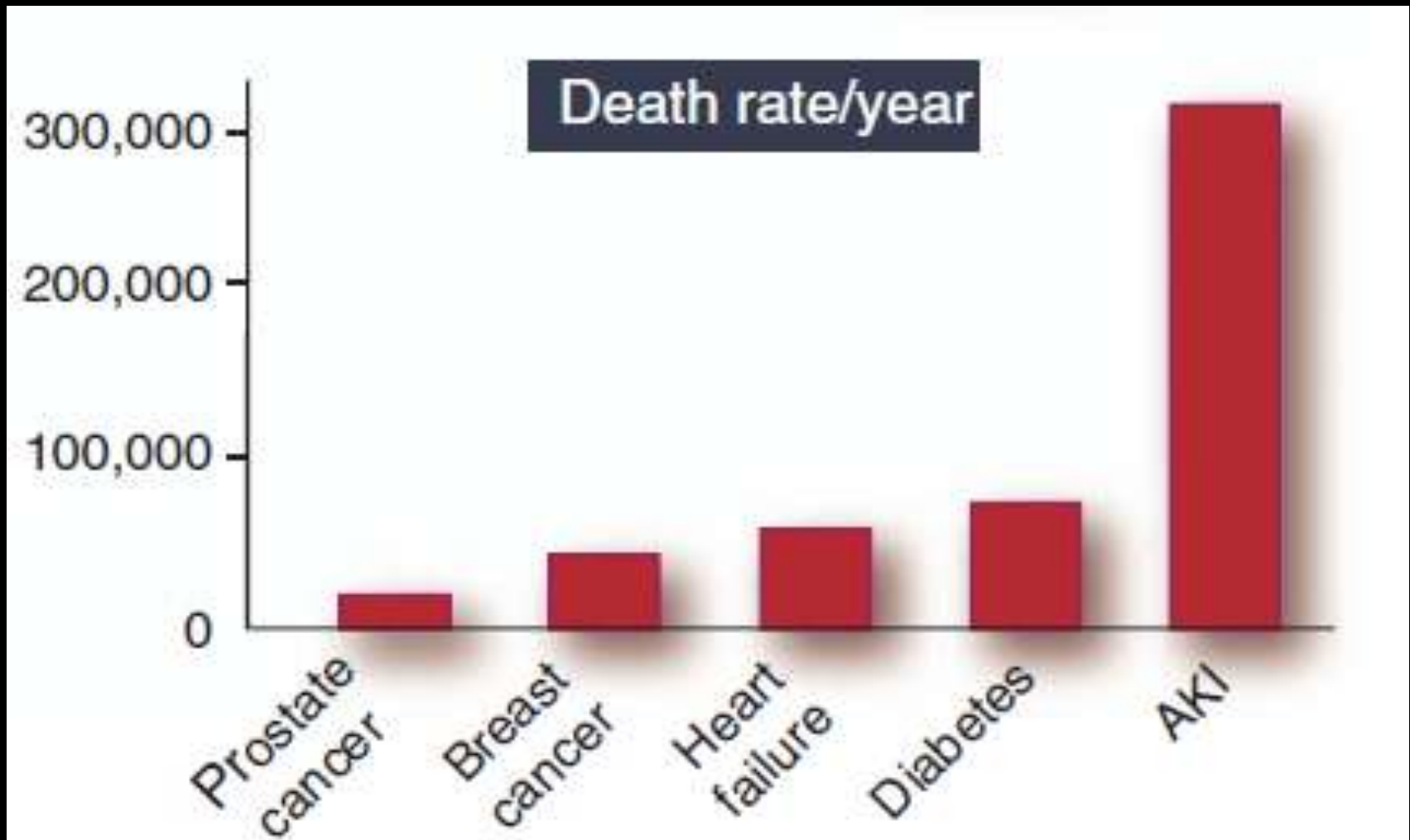
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# Introduction

# Mortality in AKI



# Mortality in AKI



Kidney International advance online publication, 1 May 2013;



To the kind attention of

Egyptian Society of Nephrology & Transplantation  
Dr. Tarek El Baz  
dr\_t\_elbaz@hotmail.com

September 2014

Subject: Oby25 initiative – request for endorsement



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الجمعية المصرية لأمراض و زراعة الكلى  
شعبة من الجمعية الطبية المصرية

السادة الاعزاء / أعضاء الجمعية المصرية لأمراض و زراعة الكلى  
تحية طيبة و بعد،

أتوجه لسيادتكم و كذلك مجلس إدارة الجمعية باسمي التهنائي بالعيد الأضحى المبارك أعاده الله علينا و على الوطن بكل الخير.

شرفت الجمعية بوجود أ.د. جوسبي ريموزي أثناء انعقاد مؤتمرنا الثاني و الثلاثون ، و قد شجرت لسيادته وجوب قيام الجمعية الدولية باهتمام اكبر بالقارة الافريقية و التي ننتمي لها.

قد اعلنت الجمعية الدولية لأمراض الكلى مبادرة جديدة تهدف الى الوصول الى هدف عالمي عام 2025م تحت اسم "صفر بحلول 2025":

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و المقصود هو الانتهاء من أي وفيات تنتج عن أسباب الفشل الكلوي الحاد و التي يمكن تجنبها ، و حيث ان مصر يجب ان تكون من الدول الرائدة في هذه المبادرة انشد سيادتكم جميعا بزيارة الموقع الالكتروني:

www.Oby25.com

للمشاركة في هذا البحث ، حيث يمكن ان تكون المشاركة فردية أو جماعية و مرفق لسيادتكم الخطاب الموجه من رئيس الجمعية الدولية لأمراض الكلى.

أتمنى ان نكون جميعا فاعلين في هذا الصدد ، و لقد وعدني رئيس الجمعية بإمكانية إقامة مؤتمر خاص بهذه المبادرة في مصر لكل الدول الافريقية عام 2016م.

وفقنا الله و إياكم،

رئيس الجمعية / أ. طارق الباز



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# Definitions Story



# Before 2004

**FRONTIERS IN NEPHROLOGY**

J Am Soc Nephrol 14: 2178–2187, 2003

Acute Renal Failure Definitions and Classification:

Time for Change?

**> 30 operational definitions of AKI**

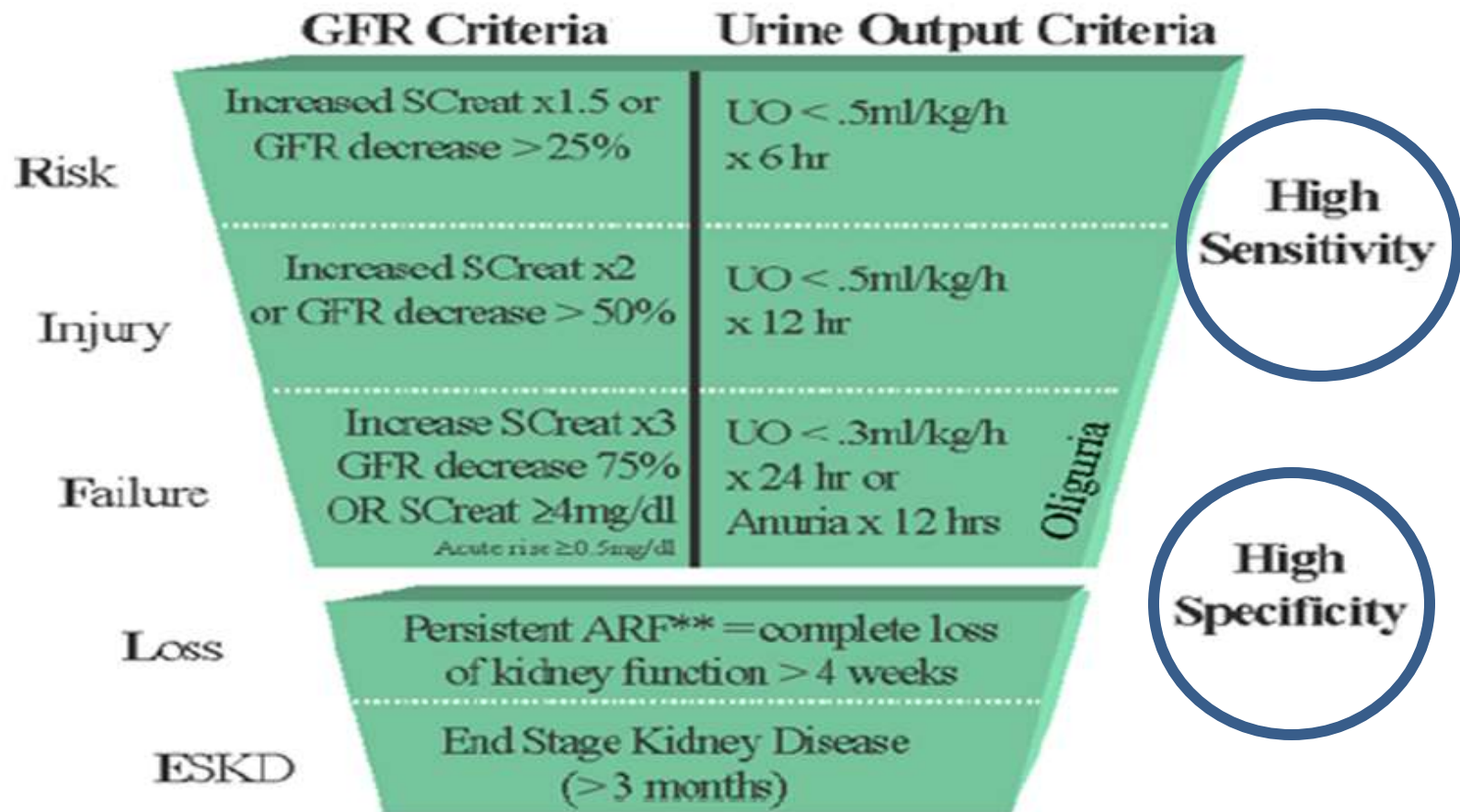
RAVINDRA L. MEHTA\* and GLENN M. CHERTOW†

*Divisions of Nephrology, Departments of Medicine, \*University of California San Diego and †University of California San Francisco, for the PICARD Study Group.*

# RIFLE Birth



# RIFLE Classification



Proposed classification scheme for acute renal failure (ARF)

# RIFLE Definition

review

<http://www.kidney-international.org>

© 2008 International Society of Nephrology

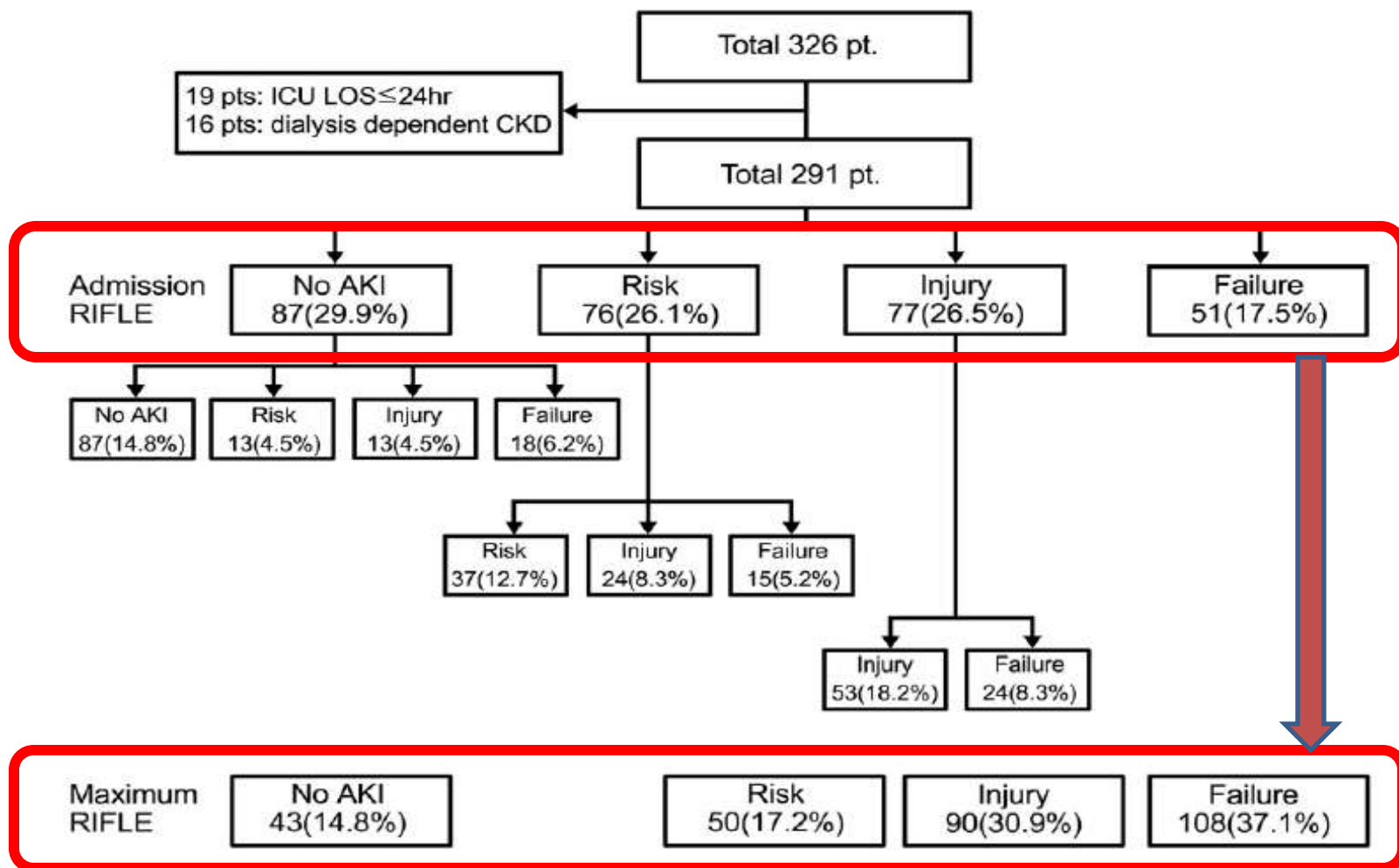
## The RIFLE criteria and mortality in acute kidney injury: A systematic review

Z Ricci<sup>1</sup>, D Cruz<sup>2,3</sup> and C Ronco<sup>2,3</sup>

<sup>1</sup>Department of Pediatric Cardiosurgery, Bambino Gesù Hospital, Rome, Italy; <sup>2</sup>Department of Nephrology, Dialysis and Transplantation, S Bortolo Hospital, Vicenza, Italy and <sup>3</sup>International Renal Research Institute Vicenza (IRRIV), Vicenza, Italy

Compared AKI levels	No of studies	RR	95% CI	P (overall effect)	P (heterogeneity)
<i>All studies</i>					
Risk vs non-AKI	13	2.40	1.94, 2.97	<0.00001	0.0001
Injury vs non-AKI	13	4.15	3.14, 5.48	<0.0001	<0.00001
Failure vs non-AKI	13	6.37	5.14, 7.90	<0.0001	<0.00001
Injury vs Risk	16	1.51	1.23, 1.86	<0.0001	<0.00001
Failure vs Risk	16	2.24	1.79, 2.81	<0.0001	<0.00001
Failure vs Injury	16	1.45	1.25, 1.69	<0.0001	<0.00001

# RIFLE in Sepsis and Septic Shock





# RIFLE Definition

<http://www.kidney-international.org>

original article

© 2012 International Society of Nephrology

## A systematic review of RIFLE criteria in children, and its application and association with measures of mortality and morbidity

Morgan B. Slater<sup>1,2,3</sup>, Vijay Anand<sup>1</sup>, Elizabeth M. Uleryk<sup>4</sup> and Christopher S. Parshuram<sup>1,2,3,5,6,7</sup>

<sup>1</sup>Department of Critical Care Medicine, The Hospital for Sick Children, Toronto, Ontario, Canada; <sup>2</sup>Child Health Evaluative Sciences, The Hospital for Sick Children, Toronto, Ontario, Canada; <sup>3</sup>Institute for Medical Science, University of Toronto, Toronto, Ontario, Canada; <sup>4</sup>Hospital Library, The Hospital for Sick Children, Toronto, Ontario, Canada; <sup>5</sup>Department of Paediatrics, University of Toronto, Toronto, Ontario, Canada; <sup>6</sup>Department of Health Policy, Management & Evaluation, University of Toronto, Toronto, Ontario, Canada and <sup>7</sup>Interdepartmental Division of Critical Care Medicine, University of Toronto, Toronto, Ontario, Canada

End stage	End-stage renal disease (persistent failure > 3 months)
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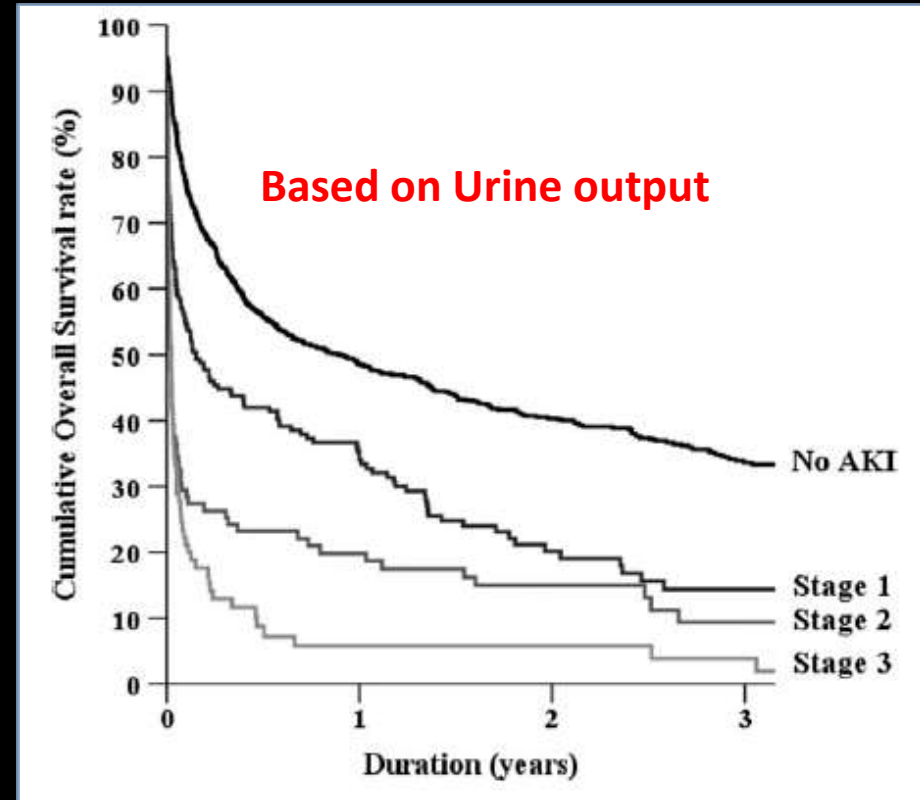
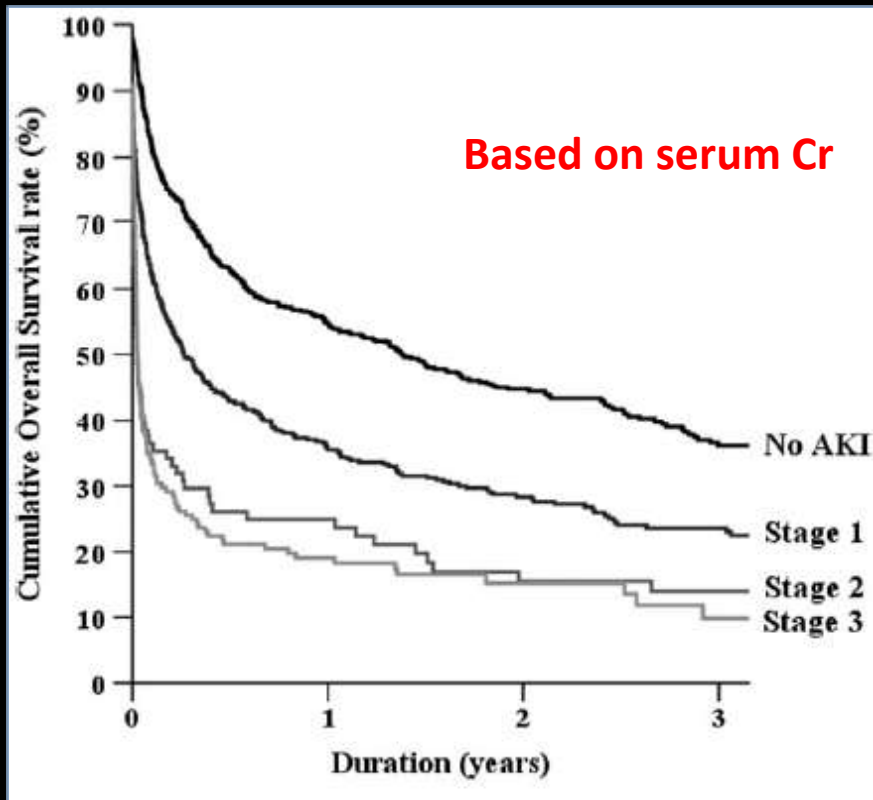
eCCI, estimated creatinine clearance; pRIFLE, pediatric risk, injury, failure, loss and end-stage renal disease.

# AKIN Classification

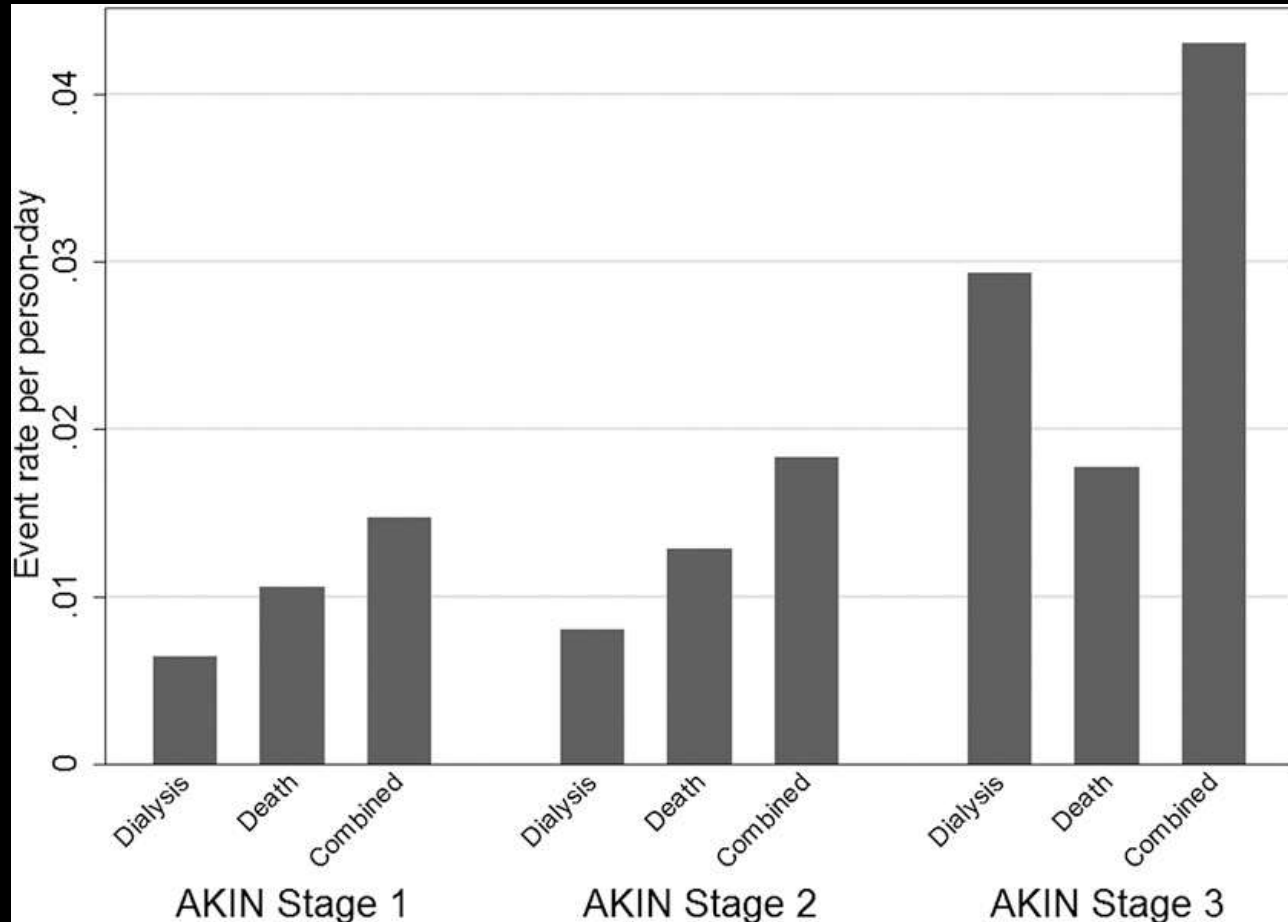
	Creatinine Criteria	Urine Output Criteria
Risk or Stage 1	creatinine $\nearrow \geq 0.3$ mg/dL or creatinine $\geq 150\%$ and $< 200\%$ than baseline	UO $< 0.5$ mL/kg/h for 6 h
Injury or Stage 2	creatinine $\geq 200\%$ and $< 300\%$ than baseline	UO $< 0.5$ mL/kg/h for 12 h
Failure or Stage 3	creatinine $\geq 300\%$ than baseline, or $\geq 4.0$ mg/dL and $\nearrow \geq 0.5$ mg/dL	UO $< 0.3$ mL/kg/h for 24 h, or anuria for 12 h
Renal Replacement Therapy		



# AKIN and Mortality in Critically Ill Patients ( n= 1625 patients)



# AKIN Classification



Clin J Am Soc Nephrol 8: 527–537, 2013.

# RIFLE/ AKIN

Setting	N	Design	Incidence and categorization of AKI (%)		Mortality (%/relative risk)		AUROC	
			RIFLE	AKIN	RIFLE	AKIN	RIFLE	AKIN
ICU Bagshaw et al.	120.123	Retrospective, multi-centre	AKI (any class) (36.1) R (16.2) I (13.6) F (6.3)	AKI (any stage) (37.1) Stage 1 (18.1) Stage 2 (10.1) Stage 3 (8.9)	Hospital mortality No AKI (8.9) AKI (any class) (24.2/3.3) R (17.9/2.2) I (27.7/3.9) F (33.2/5.1)	Hospital mortality No AKI (8.5) AKI (any stage) (24.5/3.1) Stage 1 (18.5/2.1) Stage 2 (28.1/4.2) Stage 3 (32.6/5.7)	0.660	0.670
Lopes et al.	662	Retrospective, single-centre	AKI (any class) (33.8) R (14.7) I (11) F (18.1)	AKI (any stage) (50.4) Stage 1 (21.1) Stage 2 (10.1) Stage 3 (19.2)	Hospital mortality No AKI (11) AKI (any class) (41.3/2.8) R (30.9/2.7) I (32.8/2.0) F (55/3.6)	Hospital mortality No AKI (8.5) AKI (any stage) (39.8/3.6) Stage 1 (30.7/3.5) Stage 2 (32.8/2.7) Stage 3 (53.5/3.6)	0.733	0.750
Lassnigg et al.	7.241	Prospective, multi-centre	AKI (any class) (3.0) R (2.2) I (0.6) F (0.2)	AKI (any stage) (8.2) Stage 1 (6.4) Stage 2 (0.04) Stage 3 (1.8)	30-day mortality No AKI (3.6) AKI (any class) (27.5/NS) R (29/NS) I (19/NS) F (33/NS)	30-day mortality No AKI (2.8) AKI (any stage) (23.1/NS) Stage 1 (16.4/NS) Stage 2 (66.7/NS) Stage 3 (38.2/NS)	NS	NS

# KDIGO Definition

2.1.2: AKI is staged for severity according to the following criteria. (*Not Graded*)

Stage 1: Increase in SCr by 1.5-1.9 times baseline; OR

Increase in sSCr by  $\geq 0.3$  mg/dL ( $\geq 26.5$   $\mu\text{mol/L}$ ); OR

Urine output  $< 0.5$  mL/kg/h for 6-12 hours

Stage 2: Increase in SCr by 2.0-2.9 times baseline; OR

Urine output  $< 0.5$  mL/kg/h for  $\geq 12$  hours

Stage 3: Increase in SCr by 3.0 times baseline; OR

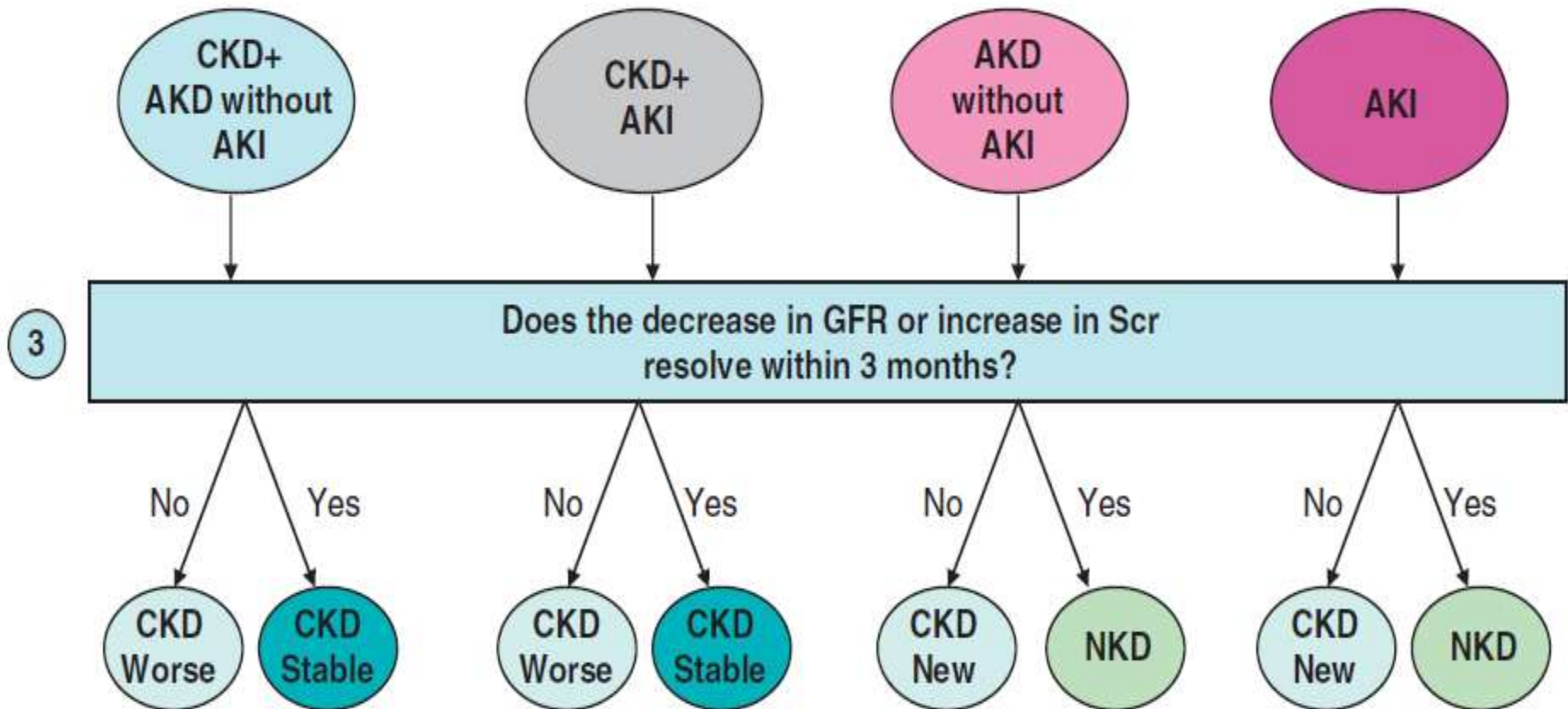
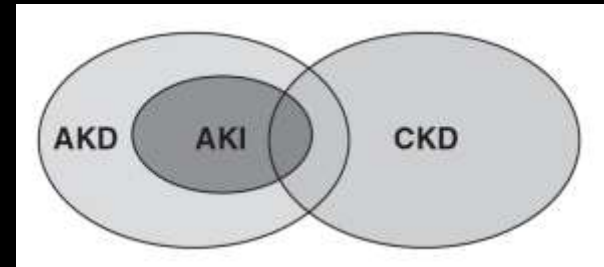
Increase in SCr to 4.0 mg/dL (353.6  $\mu\text{mol/L}$ ); OR

Initiation of renal replacement therapy; OR

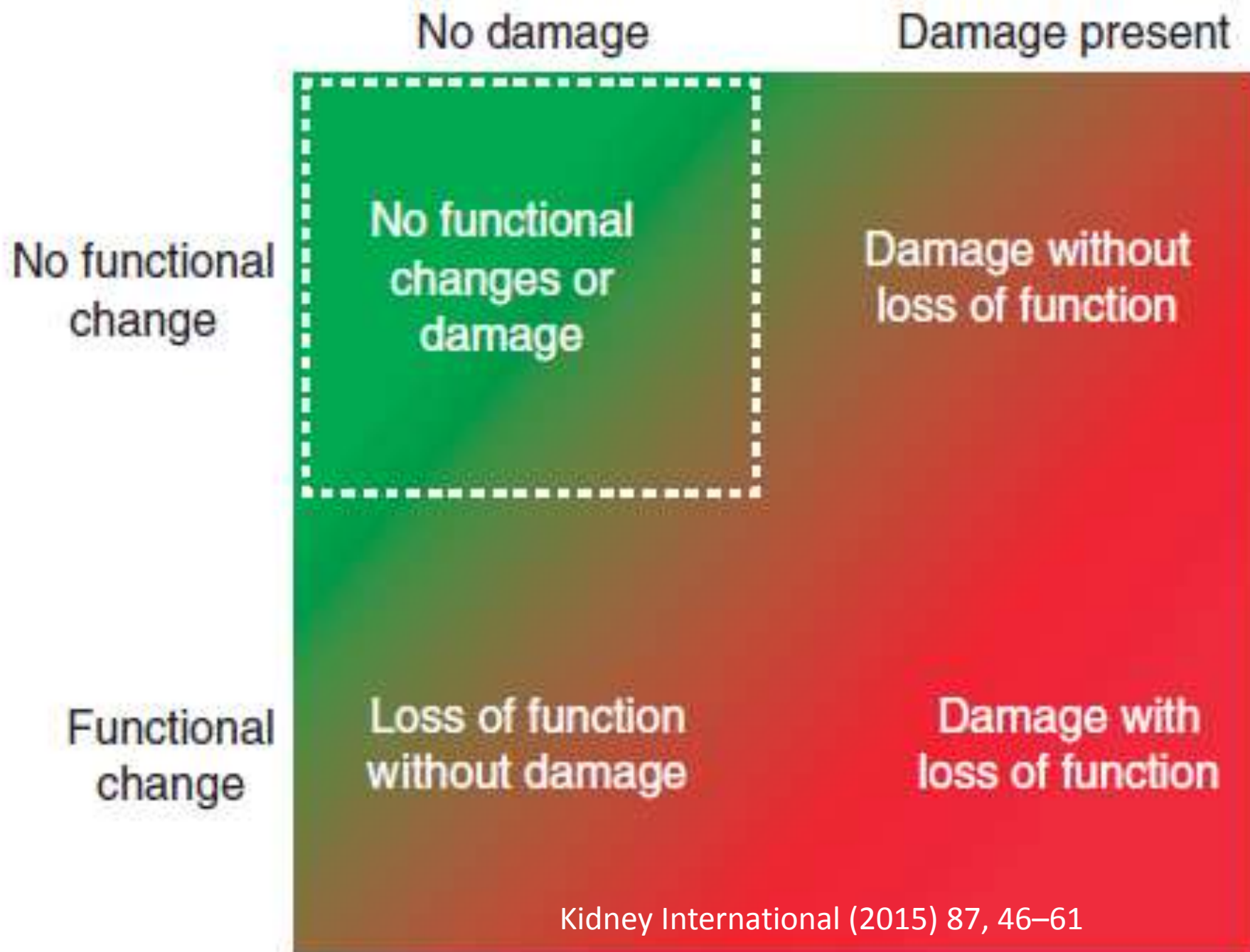
In patients  $< 18$  years, decrease in eGFR to 35 mL/min/1.73 m<sup>2</sup>; OR

Urine output  $< 0.3$  mL/kg/h for  $\geq 24$  hours; OR

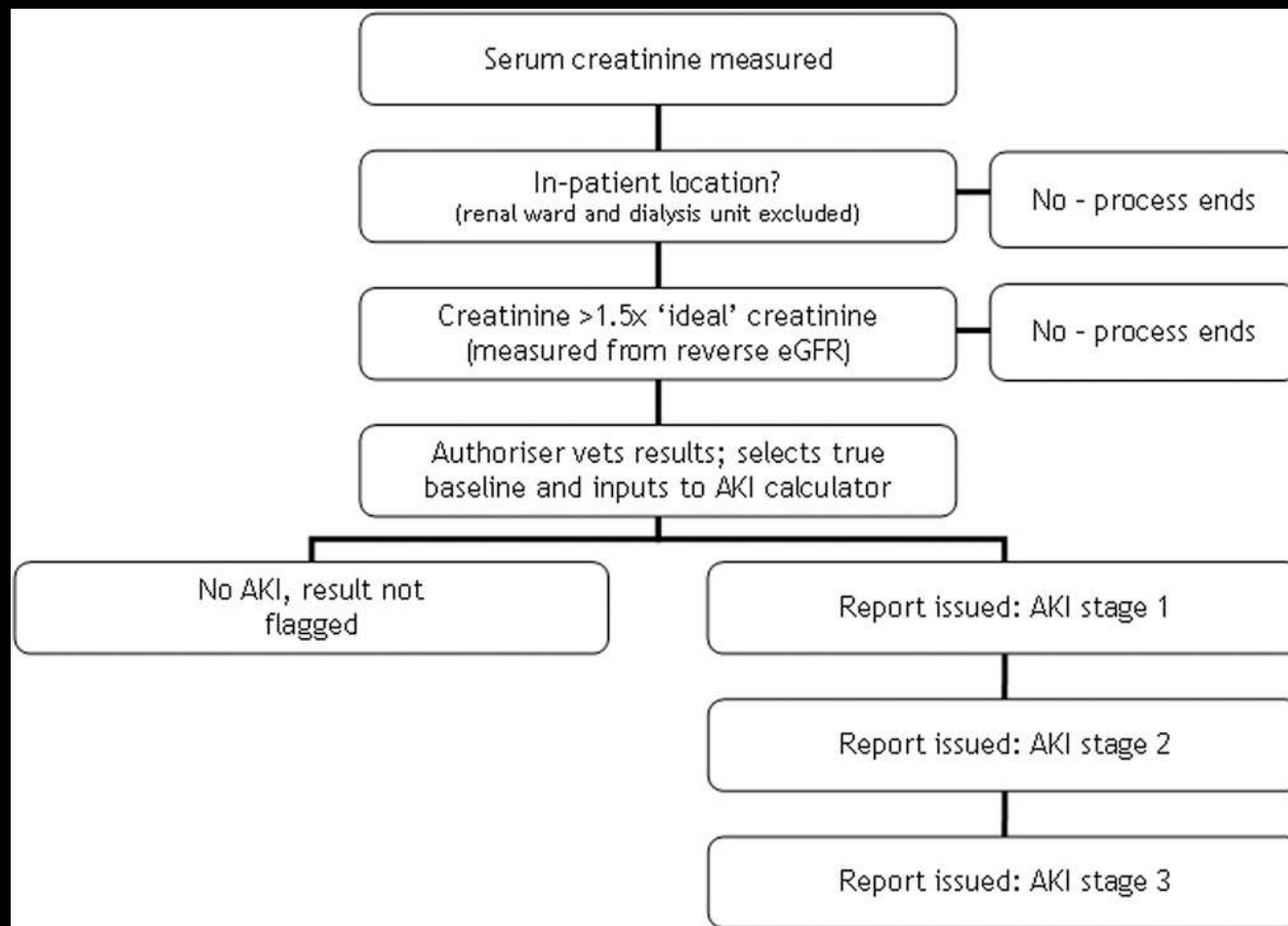
Anuria for  $\geq 12$  hours







# Real-time Electronic AKI Reporting





# Real-time Electronic AKI Reporting

## REVIEW



### Electronic alerts for acute kidney injury

- E-alert systems for AKI now exist that can systematically identify all cases of AKI on a hospital-wide basis, using current diagnostic criteria.
- E-alert systems are able to alter physician behaviour to trigger earlier intervention, and emerging data suggest that this may translate into improved patient outcomes.
- Strategies to tackle the current variability in e-alert methodology and availability are now required.

# A global Agenda to Raise Awareness

Category	Components
<i>Development of a toolkit for AKI</i>	<ul style="list-style-type: none"><li>Essential toolkit for recognition and management of AKI</li><li>Emphasis on early recognition and management</li><li>Utilize KDIGO guidelines on diagnosis and management</li><li>Identify knowledge gaps and educate</li><li>Appropriate to each region</li><li>Community- versus hospital-acquired AKI</li><li>Culturally sensitive</li><li>Avoidance of the problems of discrimination by income, gender, religion</li><li>Appropriate for the resources available</li></ul>

Kidney International advance online publication, 1 May 2013;

**What is New in 2015**

# ASN In The Loop

In Affiliation With **BulletinHealthcare**



Customized Briefing for Hussein Sheashaa MD

Saturday, February 7, 2015

## Simple Test Detects Increased Risks in Patients with AKI

Among 77 patients with early AKI, researchers found that a simple test performed with a one-time dose of furosemide, in addition to a measure of kidney function, is called the furosemide stress test, can be used to assess cardiovascular risk and potentially lead to more robust outcomes.

**CLINICAL RESEARCH**

[www.jasn.org](http://www.jasn.org)

## Furosemide Stress Test and Biomarkers for the Prediction of AKI Severity

Jay L. Koyner,<sup>\*</sup> Danielle L. Davison,<sup>†</sup> Ermira Brasha-Mitchell,<sup>†</sup> Divya M. Chalikonda,<sup>†</sup> John M. Arthur,<sup>‡</sup> Andrew D. Shaw,<sup>§</sup> James A. Tumlin,<sup>||</sup> Sharon A. Trevino,<sup>\*</sup> Michael R. Bennett,<sup>¶</sup> Paul L. Kimmel,<sup>\*\*</sup> Michael G. Seneff,<sup>†</sup> and Lakhmir S. Chawla<sup>††</sup>

<sup>\*</sup>Section of Nephrology, Department of Medicine, University of Chicago, Chicago, Illinois; <sup>†</sup>Department of Anesthesiology and Critical Care Medicine and <sup>\*\*</sup>Department of Medicine, George Washington University Medical Center, Washington DC; <sup>‡</sup>Division of Nephrology, Department of Medicine, Medical University of South Carolina, Charleston, South Carolina; <sup>§</sup>Department of Anesthesiology, Vanderbilt University Medical Center, Nashville, Tennessee; <sup>||</sup>Renal Division, University of Tennessee College of Medicine at Chattanooga, Chattanooga, Tennessee; <sup>¶</sup>Division of Nephrology and Hypertension, Cincinnati Children's Hospital, Cincinnati, Ohio; and <sup>††</sup>Department of Medicine, Division of Intensive Care Medicine and Division of Nephrology, Washington DC Veterans Affairs Medical Center, Washington, DC

# ASN In The Loop

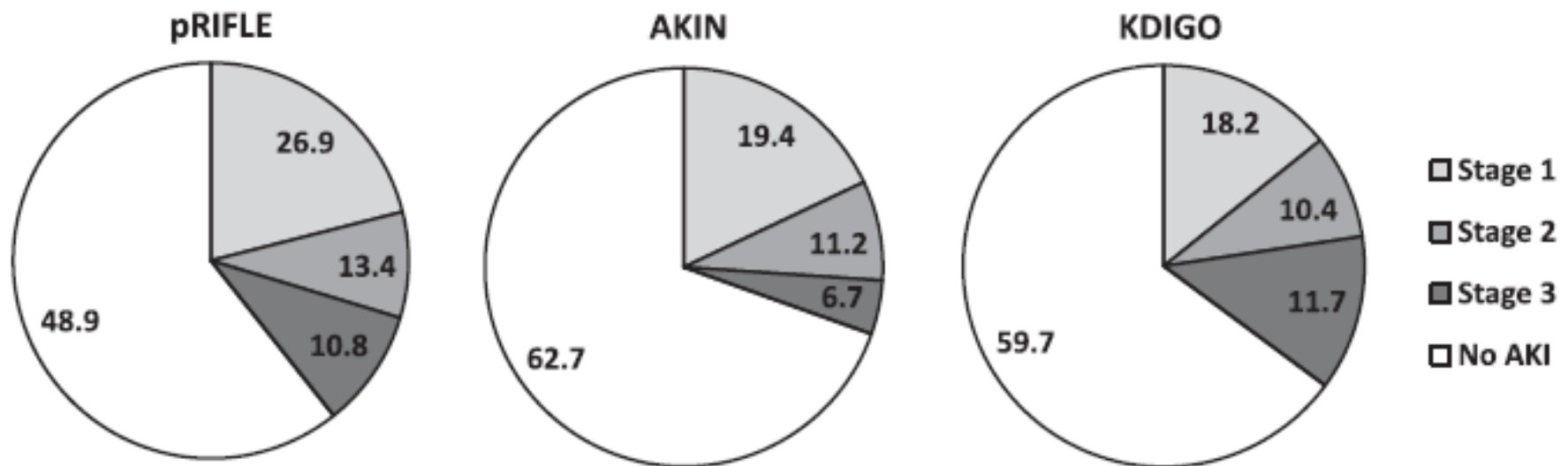
In Affiliation With **BulletinHealthcare**



Customized Briefing for Hussein Sheashaa MD

Thursday, February 5, 2015

## Study Suggests Need to Adopt a Single, Universal AKI Definition in Children



	n	Mortality	LOS
<b>AKI by all three</b>	5406	2.7%	10 (5-21)

**Table 2. Mortality likelihood ratios for AKI severity stages**

Definition	All Hospitalizations			ICU			Non-ICU		
	Stage 1	Stage 2	Stage 3	Stage 1	Stage 2	Stage 3	Stage 1	Stage 2	Stage 3
pRIFLE	1.44 (0.99 to 2.09)	2.28 (1.53 to 3.41)	6.64 (4.82 to 9.15)	3.08 (1.64 to 5.79)	6.06 (3.26 to 11.3)	20.49 (12.0 to 35.0)	0.91 (0.55 to 1.50)	0.96 (0.51 to 1.81)	1.96 (1.17 to 3.31)
AKIN	1.69 (1.19 to 2.41)	2.29 (1.57 to 3.35)	6.38	3.83	5.82	13.37	1.0	0.77	1.02
KDIGO	1.30 (0.87 to 1.93)	1.90 (1.25 to 2.89) <sup>a</sup>	5.15 (3.84 to 6.90) <sup>a</sup>	2.85 (1.59 to 5.13) <sup>a</sup>	4.42 (2.47 to 7.89) <sup>a</sup>	14.34 (9.18 to 22.4) <sup>a</sup>	0.73 (0.41 to 1.30)	0.82 (0.41 to 1.64)	1.22 (0.69 to 2.13)

The likelihood of death (and 95% confidence interval) for each AKI severity stage is compared with that of hospitalizations not complicated by AKI. ICU, intensive care unit.

<sup>a</sup>P<0.05 after correction for multiple testing.

<b>Not diagnosed by AKIN</b>	427	0.7%	12 (7-18)
<b>Not diagnosed by KDIGO</b>	0	n/a	n/a

# Classifying AKI by Urine Output versus Serum Creatinine Level

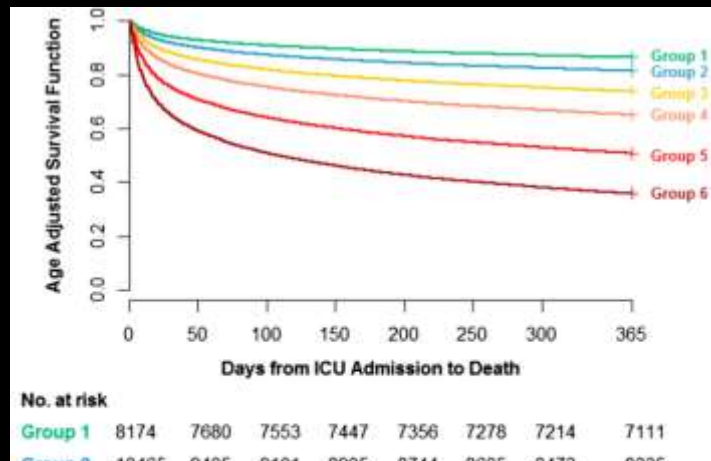
John A. Kellum,<sup>\*†</sup> Florentina E. Sileanu,<sup>\*†‡</sup> Raghavan Murugan,<sup>\*†</sup> Nicole Lucko,<sup>\*†</sup>  
Andrew D. Shaw,<sup>\*§</sup> and Gilles Clermont<sup>\*†</sup>

<sup>\*</sup>Center for Critical Care Nephrology and <sup>†</sup>Clinical Research, Investigation, and Systems Modeling of Acute Illness Center, Department of Critical Care Medicine, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania;

<sup>‡</sup>Department of Biostatistics, University of Pittsburgh Graduate School of Public Health, Pittsburgh, Pennsylvania; and

<sup>§</sup>Department of Anesthesiology, Vanderbilt University Medical Center, Nashville, Tennessee





**32,045 adult  
ICU patients**

We conclude that short- and long-term risk of death or RRT is greatest when patients meet both the serum creatinine level and urine output criteria for AKI and when these abnormalities persist.

Table 2. Outcomes for patients with maximum AKI severity by UO, SC, or both (n=23,866)

Characteristic	No AKI (n=8179)	Maximum AKI Severity			P Value <sup>c</sup>
		UO (n=14,177)	SC (n=4694)	Both (n=4995)	
Duration of stage 3 AKI (d), mean (SD)	N/A	1.3 (0.6)	3.5 (4)	5.6 (6.9)	<0.001
RRT during hospital stay	4 (0)	304 (2.1)	232 (4.9)	1251 (25)	<0.001
Length of stay (d), median (Q1, Q3) <sup>a</sup>					
ICU	3 (2–4)	5 (3–9)	4 (2–6)	7 (4–15)	<0.001
Hospital	7 (5–11)	13 (8–22)	14 (8–24)	22 (12–38)	<0.001
Mortality					
Hospital	350 (4.3)	1761 (12.4)	788 (16.8)	1597 (32)	<0.001
30 days <sup>b</sup>	425 (5.2)	1822 (12.9)	808 (17.2)	1375 (27.5)	<0.001
90 days <sup>b</sup>	596 (7.3)	2710 (19.1)	1074 (22.9)	1890 (37.8)	<0.001
1 year <sup>b</sup>	1064 (13)	3966 (28)	1498 (31.9)	2395 (47.9)	<0.001

Data are presented as n (%) unless otherwise indicated. N/A, not applicable.

<sup>a</sup>Length of stay was calculated only in hospital survivors.

<sup>b</sup>Days from ICU admission.

<sup>c</sup>P values are shown for difference among the three groups of AKI patients. Patients without AKI are also shown but are not formally compared.

